NB4043/1182.019

In The Claims

Kindly enter the claim amendments, without prejudice, as set forth below. A complete listing of the claims is provided, with a parenthetical indication of the status of each claim and markings to show current changes.

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NEW CLAIMS

1.(currently amended) A method for on-line control of a butt-welding machine of the flash-welding type for bars, blooms or billets, during welding cycles, comprising the steps of

- controlling an actuation of ~~a first actuator (U) for opening~~ a valve controlling positioning of clamps of the welding machine; and

- controlling the triggering angle of a partializer for controlling the thermal power supplied to the welding process;

said controlling steps being regulated on the basis of an analysis by a dynamic state observer (A) of the history of the welding process during execution of each welding cycle, characterised by the fact that said dynamic state observer (A) ~~for estimating~~ estimates, by means of a mathematical model, the trend of a plurality of state variables (X) and of performance variables (Z), the latter comprising at least the arc length, ~~to be~~ used as basis for ~~the action of~~ controlling the welding cycle itself and the subsequent welding cycles, using a plurality of direct measurements (Ym).

2. (previously presented) The method according to Claim 1, wherein for regulating said controlling steps there is provided:

- observing state variables (X) of the welding cycles by the dynamic state observer (A);

- defining pre-determined optimal paths (Z_{set}) to be followed by a plurality of performance variables (Z) by means of a dynamic path generator (B) for

performance variables (Z);

- executing a dynamic control law (C) based upon the value of the performance variables (Z), of the optimal paths (Z_{set}) and of an operating strategy determined according to the step that the welding process is undergoing; and

- generating sync signals (Sync) by means of a signal generator (E), on the basis of which the dynamic control law (C) adopts the given operating strategies.

3. (currently amended) The method according to Claim 2, wherein the ~~performance variables (Z) controlled by the~~ dynamic control law (C), ~~comprise: arc impedance,~~ during a scintillation step of the welding process, maintains the arc length constant and varies the primary voltage ~~of arc current~~ on the basis of the variation of arc impedance.

4. (previously presented) The method according to Claim 3, wherein an on-line diagnosis is provided by a dynamic diagnostics system (D), for which the comparison of the paths of the performance variables (Z) is made with the desired paths (Z_{set}) by said dynamic diagnostics system (D), generating weld quality indices.

5. (previously presented) The method according to Claim 6, wherein there is provided automatic on-line variation of the transformation ratio of a transformer (tap changing) for supply of the butt-welding machine.

6. (currently amended) A system for controlling a butt-welding machine for bars, blooms or billets, ~~for implementing the method according to Claim 1~~, wherein the machine comprises ~~an actuator (U) for opening~~ a valve for controlling positioning of clamps of the ~~butt-welding~~ machine, and a partializer, wherein the

control system is adapted to perform the method according to claim 1 and comprises:

- a dynamic state observer (A) adapted for observing a plurality of state variables (X) of a welding process carried out by ~~the~~ said machine;

- a dynamic path generator (B) for performance variables (Z), adapted for defining pre-determined optimal paths (Z_{set}) for the performance variables (Z) to follow, the latter comprising at least an arc length;

- a dynamic control law (C) adapted for controlling the valve ~~actuator (U)~~ and the partializer on the basis of the value of the performance variables (Z) and of the optimal pre-determined paths (Z_{set}); and

- a generator (E) of sync signals adapted for generating sync signals (Sync).

7. (previously presented) The system according to Claim 6, wherein there is provided a transformation ratio variator (tap changer), adapted for controlling the transformation ratio.

8. (previously presented) The system according to Claim 7, wherein a dynamic diagnostics system (D) is provided, adapted for generating indices of weld quality, comparing the paths of the performance variables (Z) with the desired paths (Z_{set}).

9. (previously presented) The system according to Claim 8, wherein the observer (A) of dynamic state, the dynamic path generator (B), the dynamic control law (C), the generator of sync signals (E), and the dynamic diagnostics system (D) are implemented by means of a computer program.

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10. (cancelled)

11. (cancelled)